

ABSTRACT

The present invention provides an optical device and the like which can collect incident light at a high incident angle than an existing microlens, in order to realize a solid-state imaging apparatus and the like corresponding to an optical system (an optical system with a high incident angle θ) with a short focal length for a thin camera.

Each unit pixel ($2.8\ \mu\text{m}$ square in size) is made up of a distributed index lens 1, a color filter 2 for green G, Al wirings 3, a signal transmitting unit 4, planarizing films 5, a light-receiving device (Si photodiodes) 6, and a Si substrate 7. The distributed index lens 1 is made of high refractive index materials 33 [TiO_2 ($n=2.53$)] and low refractive index materials 34 [air ($n=1.0$)] having concentric zones. Further, in a distributed refractive index lens, a width 35 of adjacent divided areas is 200nm. Also, a film thickness t is $0.5\ \mu\text{m}$.